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REMARKS/ARGUMENTS

Claims 1-3 and 6-20 are pending in this application. By this Amendment, Applicants amend claims 1 and 11.

Claims 1-3 and 6-15 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ando et al. (U.S. 6,515,401) in view of Kobrin et al. (U.S. 5,936,150). Claims 16-20 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ando et al. in view of Kobrin et al., and further in view of Ogawa et al. (EP 0 669 713). Applicants respectfully traverse these rejections.

Claim 1 has been amended to recite:

"A piezoelectric resonator comprising:
a substrate;
a vibration unit disposed on the substrate and having a structure in which at least one pair of an upper electrode and a lower electrode are opposed to each other, **the upper and lower electrodes sandwiching the upper and lower surfaces of an internal thin-film portion including at least one layer of a piezoelectric thin-film; and**
an external thin-film portion provided under the lower electrode and including at least one layer of one of a piezoelectric thin-film and a dielectric thin-film; wherein
the vibration unit is vibrated in an n-th harmonic, where n is an integer of 2 or greater, the upper electrode and the lower electrode are located substantially in the positions of the loops of the n-th harmonic;
wherein
the external thin-film portion includes an SiO₂ thin-film as a major component;
the internal thin-film portion includes AlN as a major component; and
nodes of the n-th harmonic exist in the internal and external thin-film portions." (emphasis added)

With the unique combination and arrangement of elements recited in Applicants' claim 1, including the features of "the external thin-film portion includes an SiO₂ thin-film as a major component," "the external thin-film portion includes an SiO₂ thin-film as a major component," "the internal thin-film portion includes AlN as a major component" and "nodes of the n-th harmonic exist in the internal and external thin-film portions,"

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Applicants have been able to provide a piezoelectric resonator in which the loss of resonance energy on electrodes is greatly reduced, and the stability of the resonance frequency to changes in temperatures is significantly improved (see, for example, the first full paragraph on page 3 of the originally filed specification).

The present invention includes an internal thin-film portion that is made of AlN and an external thin-film portion that is made of SiO₂. The acoustic velocities of AlN (about 10,000 m/sec) and SiO₂ (about 5,500 m/sec) are very different from each other. Thus, conventionally, in resonators including thin-film portions made of AlN and SiO₂, the loss of resonance energy is greatly increased and the TCF changes significantly. To overcome these problems, the inventors of the present invention discovered that by positioning the internal and external thin-film portions at the nodes of the n-th harmonic, the loss of resonance energy is greatly reduced and the TCF is prevented from changing significantly.

The Examiner acknowledged that Ando et al. fails to teach or suggest the features of "the external thin-film portion includes an SiO₂ thin-film as a major component" and "the internal thin-film portion includes AlN as a major component." However, the Examiner alleged that Kobrin et al. "combines AlN and SiO₂ piezoelectric layers." Thus, the Examiner concluded that it would have been obvious "to have applied Kobrin's piezoelectric layer teachings to Ando's resonator. The motivation would have been to achieve very high acoustic reflectivity [described in detail in column 4 of Kobrin] by using alternating layers." Applicants respectfully disagree.

First, neither Ando et al. nor Kobrin et al. teaches or suggests anything at all about the location of internal and external thin-film portions with respect to nodes of an n-th harmonic. Thus, Ando et al. and Kobrin et al. clearly fail to teach or suggest the feature of "nodes of the n-th harmonic exist in the internal and external thin-film portions" as recited in Applicants' claim 1.

Second, even assuming *arguendo* that one of Ando et al. and Kobrin et al. taught or suggested the feature of "nodes of the n-th harmonic exist in the internal and external

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thin-film portions," the combination of Ando et al. and Kobrin et al. still fails to teach or suggest the combination and arrangement of elements recited in Applicants' claim 1. Particularly, although Kobrin et al. teaches the use of AlN and SiO₂ in a resonant sensor, Kobrin et al. clearly fails to teach or suggest that SiO₂ could or should be used for an external thin-film portion as defined in Applicants' claim 1.

As disclosed in Kobrin et al. layers 13 and 19 are made of SiO₂ and layer 16 is made of AlN. As clearly seen in Figs. 1 and 3 of Kobrin, layer 13 of Kobrin et al. is disposed above the AlN layer 16, and layer 19 of Kobrin et al. is embedded inside of the structure of the resonant chemical sensor, with layers 20, 22, 24 and 26 disposed externally thereof. Thus, neither of the SiO₂ layers 13 and 19 of Kobrin et al. can be fairly construed as "an external thin-film portion provided under the lower electrode and including at least one layer of one of a piezoelectric thin-film and a dielectric thin-film" wherein "the external thin-film portion includes an SiO₂ thin-film as a major component" as recited in Applicants' claim 1.

Applicants' invention must be considered "as a whole". Medtronic, Inc., v. Cardiac Pacemakers, Inc., 220 USPQ 97, 99-100 (Fed. Cir. 1983). Rather than considering the invention "as a whole," the Examiner has improperly reduced Applicants' claimed invention to the broad "idea" of using AlN and SiO₂ in a piezoelectric resonator, and has ignored the specific structural arrangement of elements recited in Applicants' claim 1. Reducing a claimed invention to an "idea" and then determining patentability of that "idea" is error. Jones v. Hardy, 220 USPQ 1021, 1024 (Fed. Cir. 1984).

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Ando et al. in view of Kobrin et al.

The Examiner relied upon Ogawa et al. to allegedly cure deficiencies of Ando et al. and Kobrin et al. However, Ogawa et al. fails to teach or suggest the features of "the external thin-film portion includes an SiO₂ thin-film as a major component," "the external

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thin-film portion includes an SiO₂ thin-film as a major component," "the internal thin-film portion includes AlN as a major component" and "nodes of the n-th harmonic exist in the internal and external thin-film portions" as recited in Applicants' claim 1. Thus, Applicants respectfully submit that Ogawa et al. fails to cure the deficiencies of Ando et al. and Kobrin et al. described above.

Accordingly, Applicants respectfully submit that Ando et al., Kobrin et al. and Ogawa et al., applied alone or in combination, fail to teach or suggest the unique combination and arrangement of elements recited in Applicants' claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that Claim 1 is allowable. Claims 2, 3 and 6-20 depend upon claim 1, and are therefore allowable for at least the reasons that claim 1 is allowable.

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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